

## Review 22 Accumulation Functions

$$g(x) = \int_a^x f(t) dt$$

$$g'(x) = f(x) \leftarrow \text{rate of change of } g$$

given  $g(a)$ , find  $g(b)$

$$g(b) = g(a) + \int_a^b f(t) dt$$

final
initial
net change in  $g(x)$

Ex 1. A tank holds 1200 gal at  $t=0$ .

For  $0 \leq t \leq 18$  water is pumped in at a rate of  $E(t) = 95\sqrt{t} \sin^2\left(\frac{t}{6}\right) \frac{\text{gal}}{\text{hr}}$

water is pumped out at a rate of  $R(t) = 275 \sin^2\left(\frac{t}{3}\right) \frac{\text{gal}}{\text{hr}}$

a) How many gallons are in the tank at  $t=18$ ?

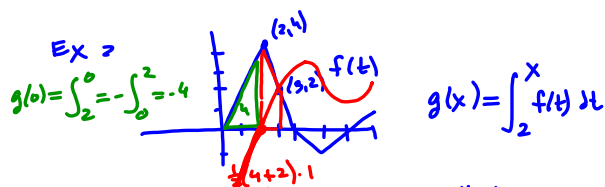
b) For  $t > 18$  no more water is pumped in. How long from this time to empty the tank?

a)  $1200 + \int_0^{18} E(t) - R(t) dt = 1310 \text{ gal}$

b)  $\int_{18}^k R(t) dt = 1310 \quad k = 24 \text{ hr}$

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a) Find  $g(3) = 3$ ,  $g'(3) = 2$ ,  $g''(3) = -\frac{4}{2} = -2$

b) Find the average rate of change of  $g(x)$  on  $[0, 3]$   $\frac{g(3) - g(0)}{3 - 0} = \frac{3 - (-4)}{3 - 0} = \frac{7}{3}$

c) where does  $g$  have abs max

$\begin{matrix} 0 & -4 \\ 4 & 4 \\ 6 & 3 \\ 7 & 3\frac{1}{2} \end{matrix}$ 
 ax  $x=4$

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